

Negative Refraction Metamaterials in Optics

Vladimir M. Shalaev, W. Cai, U. Chettiar, H.-K. Yuan, A. K. Sarychev, V. P. Drachev,
and A. V. Kildishev

School of Electrical and Computer Engineering, Purdue University, West Lafayette, IN
47907, U.S.A.

An array of pairs of parallel gold nanorods can form a metamaterial with a negative refractive index in the optical range. Such behavior results from the plasmon resonance in the pairs of nanorods for both the electric and magnetic components of light. The metal rods act as inductive elements whereas the dielectric gaps perform as capacitive elements, forming an optical LC-circuit. Our experiments and simulations demonstrate the resonant behavior for the index of refraction. Above the resonance, the refractive index becomes negative. Paired metal nanorods open new opportunities for developing negative-refraction materials in optics.